ATTACHMENT 4

APPENDIX 1

DESCRIPTION OF CHEMICAL AGENT IDENTIFICATION SET TYPES

4-1-1 BACKGROUND SUMMARY

Chemical agent identification sets (CAIS) were developed and manufactured by the Department of the Army (DA) from the 1930s through the 1960s. Approximately 110,000 sets were manufactured. They were distributed to the Department of Defense (DoD) installations for use by all services in training for identifying the various chemical agents that may be encountered on a battlefield.

In April 1971, the DA declared the CAIS obsolete. In 1978 and 1980, two consolidation efforts were completed to gather existing CAIS that were not expended during training and were still in storage at various DoD installations. The consolidation was accomplished at Rocky Mountain Arsenal, Denver, Colorado. All CAIS located at Rocky Mountain Arsenal were destroyed in the CAIS disposal program. A total of 21,458 CAISs were destroyed in the pilot test program in 1979 and during the actual CAIS disposal program from May 1981 through December 1982. However, not all CAIS were accounted for. To date, some unaccounted CAIS have been discovered at isolated storage locations. Periodically, CAIS will continue to be found in this manner, and will need to be destroyed.

4-1-2 CLASSIFICATIONS OF CHEMICAL AGENT IDENTIFICATION SETS

The 17 different sets of CAIS have been classified by both variety and type or Department of Defense Identification Code (DODIC) number groupings. The following paragraphs explain these various classification systems. One type of CAIS, the K945, which was the only set to have contained the nerve agent GB, was completely accounted for and destroyed at RMA by incineration. The K945 kits were produced in very limited quantities and issued to only a few locations. The K945 CAIS were never used for training purposes. Since no K945 CAIS are believed to have survived, they are not addressed in this attachment.

4-1-2.1 Variety

CAIS has been classified into three varieties, as described in the following paragraphs.

a. *Sniff Set.* One major variety of CAIS was an instructional sniff set that contained agents and industrial chemicals impregnated on charcoal. The set was intended for use indoors to instruct military personnel in recognizing the odors of the agents.

These sets contained only small amounts of agent.

b. *Sealed Pyrex™ Tubes.* A second variety, designed for use outdoors, consisted of agents and industrial chemicals (pure, also known as neat, or in chloroform solution) in sealed Pyrex™ tubes. These glass ampules would be detonated, creating an agent cloud. Soldiers would then try to identify the agent based on its odor and other characteristics. These sets typically contained more total agent than the instructional sniff sets.

c. *Bulk Mustard.* A third variety were those containing larger quantities of mustard. These CAIS were used in decontamination training by purposely contaminating the terrain or equipment with mustard and then teaching the soldiers how to don protective clothing and decontaminate the area or equipment. These CAIS contained relatively large quantities of pure mustard relative to both the sniff sets and sealed Pyrex™ tubes.

4-1-2.2 Type or Department of Defense Identification Code Groupings

CAIS has been grouped into seven types or DODIC groupings. Six types are shown as follows. The seventh was the K945 training set, M72, which has been accounted for completely.

a. K941 - toxic gas set, M1
b. K942 - toxic gas set, M2
c. K951 and K952 - identification sets, M1
d. K953 and K954 - Identification sets, AN-M1A1
e. K955 - Navy training set
f. X302 and X545 through X552 - replacement sets

4-1-3 SUMMARY OF CHEMICAL AGENT IDENTIFICATION SETS

Tables 4-1-1 and 4-1-2 summarize the various CAIS. Table 4-1-1 addresses the classification and packaging, and Table 4-1-2 provides a summary of CAIS chemical agents and industrial chemicals and their applicable state and Resource Conservation and Recovery Act (RCRA) waste codes.

4-1-4 DETAILED DESCRIPTION OF CHEMICAL AGENT IDENTIFICATION SETS

4-1-4.1 **Set K941 - Toxic Gas Set, M1** (Figure 4-1-1)

a. *Old stock number:* FSN 1365-219-8574

b. *Timeframe of use:* World War II (WWII) to late 1950s

c. *Chemical agents and amounts:* Twenty-four bottles, each containing approximately 103 milliliters (ml) of sulfur mustard (H/HS/HD) or distilled mustard (HD) for a total of 2.5 liters per set.

d. *Packaging:*

1. *Bottle:* Twenty-four round, glass, 4-ounce bottles, each with a small plastic screw top. Heat-resistant paint on the bottles indicates "H" or "HD", "TOXIC GAS SET, M1".

2. *Can:* Four bottles are packed in 0.5-inch layers of sawdust within a pressure sealed metal can. The round cans are 5.5 inches in diameter and 6.25 inches high. Each can has a coffee-can-type key on the bottom for opening.

3. *PIG:* Six metal cans are packed into a steel shipping cylinder known as a PIG. The PIG is 6.625 inches in diameter, approximately 40 inches long, and 0.145 inches thick. The open end of the PIG is closed by a flange end-cover called a flange blank. The flange blank is 9.25 inches in diameter and is secured by eight bolts tightened over a 0.125-inch-thick lead gasket. The empty PIG weighs approximately 80 pounds.

4-1-4.2 Set K942 - Toxic Gas Set, M2 (Figure 4-1-2)

a. *Old stock number:* FSN 1365-563-4146

b. *Timeframe of use:* Korean War era

c. *Chemical agents and amounts:* Twenty-eight bottles, each containing approximately 118 mL of mustard (H, HD, or HS) for a total of 3.3 liters per set.

d. *Packaging:*

1. *Bottle:* Twenty-eight round, glass bottles are heat-sealed at one end. Reference is made to this glass container as an ampule; however, it is more similar to a bottle. It is 1.875 inches in diameter and 4.625 inches high.

Table 4-1-1. Summary of Chemical Agent Identification Sets Classifications and Original Packaging

CAIS DODIC	Types(Nomenclature, Model)	Varieties	Outer Container	Agent Container, (Number of Containers)	Containers per Packaging
K941	Toxic gas set, M1	Bulk mustard	PIG	Bottle (24)	4 bottles per pressure sealed can[a] with 6 pressure sealed cans[a] per PIG
K942	Toxic gas set, M2	Bulk mustard	Drum	Heat-sealed bottle (28)	1 heat-sealed bottle per pressure sealed can[a] with 28 pressure sealed cans[a] per drum
K951,K952	Identification set, M1	Sealed Pyrex™ tubes	PIG	Ampule (48)	12 ampules per press-fit can[b] with 4 press-fit cans[b] per PIG
K953, K954	Identification set, AN-M1A1	Sealed Pyrex™ tubes	PIG	Ampule (48)	12 ampules per press-fit can[b] with 4 press-fit cans[b] per PIG
K955	Navy Identification set	Sniff set	Wooden box	Bottle (7)	1 bottle per sealed can[c] with 7 sealed cans[c] per box
X302, X545 through 552	Navy Replacement set	Sniff sets	Wooden box	Bottle (2)	1 bottle per sealed can[c] with 2 sealed cans[c] per box

Notes:

[a] coffee-can-type key
[b] cookie can lid
[c] paint can lid

Table 4-1-2. Summary of Chemical Agent Identification Sets DODIC's and the Chemical Agents/Industrial Chemicals Contents

NODII-32

Chemical Agents/ Industrial Chemicals	N	CC			CHLOROFORM				CC	N		N	SOLIDS		
	H[a]	(H)[a]	(HN)	(L)	H[a] 5%	HN 10%	L 5%	PS 50%	(PS)	CK	GA Sim	CG	CG Sim	CN	DM
Department of Defense Identification Codes (DODIC)	D004-D011, D022, D028, D043; P999	D004-D011, D022, D028, D043; P999	D004-D011, D022, D028, D043; P999	D004-D011, D022, D028, D043; P999	D004-D011, D022, D028, D043; P999	D004-D011, D022, D028, D043; P999	D004-D011, D022, D028, D043; P999			P033		P095			
K941$_{(24)}$	B_{24}														
K942$_{(28)}$	B_{28}														
K951/2$_{(48)}$					A_{12}		A_{12}	A_{12}				A_{12}			
K953/4$_{(48)}$					A_{8}	A_{8}	A_{8}			A_{8}	A_{8}	A_{8}			
K955$_{(7)}$		$(B)_2$		(B)					(B)				B	B	B
X302$_{(2)}$			$(B)_2$												
X545$_{(2)}$													B_2		
X546$_{(2)}$														B_2	
X547$_{(2)}$		$(B)_2$													
X548$_{(2)}$				$(B)_2$											
X549$_{(2)}$															B_2
X550$_{(2)}$			$(B)_2$												
X551$_{(2)}$			$(B)_2$												
X552$_{(2)}$									$(B)_2$						

[----------Chemical Agents to be Neutralized ----------] [---------- Industrial Chemicals to be Repackaged ----------]

Note:
[a] H = H/HS/HD

KEY: $B_{\#}$=Bottle$_{\text{Number of}}$ $A_{\#}$=Ampule$_{\text{Number of}}$ (B)=Bottle with Charcoal A=Ampule with Chloroform

N = Neat CC = Charcoal

2. *Can:* Each bottle has its own metal can. The round metal can is 2.68 inches in diameter and 6.34 inches high. Each can has a coffee-can-type key on the bottom for opening.

3. *Drum:* Twenty-eight cans are packed in a cold-rolled carbon steel drum. The drum is 14 inches in diameter, 14 inches high, and 0.0375 inches thick (20 gauge). There are two layers of cans (14 cans per layer). The cans are separated into individual compartments by fiberboard packaging.

Note: Some of CAIS K942 were repackaged into press-fit cans (as found in the K951). There were two bottles per can with vermiculite or sawdust used as a packing material. Four cans were packaged into a PIG (like the K941 PIG).

4-1-4.3 Set K951 - War Gas Identification Set, Detonation, M1; and Set K952 - War Gas Identification Set, Instructional, M1 (Figure 4-1-3)

a. *Old stock number:* FSN 1365-025-3273 (K951), FSN 1365-025-3783 (K952)

b. *Timeframe of use:* Early 1930s to late 1950s

c. *Chemical agents and amounts:* Forty-eight glass ampules, of which there are 12 ampules each of 4 different chemical agents/industrial chemicals. Sulfur mustard and lewisite (L) chemical agent ampules contain approximately 40 mL of solution (chemical agent in chloroform) for a total of 960 mL of solution with chemical agent per set, or 48 mL of chemical agent per set.

1. Twelve ampules of 5-percent sulfur mustard in chloroform, each with 2 mL sulfur mustard in 38 mL chloroform for a total of 24 mL sulfur mustard and 456 mL chloroform.

2. Twelve ampules of 5-percent L in chloroform, each with 2 mL L in 38 mL chloroform for a total of 24 mL L and 456 mL chloroform.

3. Twelve ampules of 50-percent PS in chloroform, each with 20 mL PS in 20 mL chloroform for a total of 240 mL PS and 240 mL chloroform.

4. Twelve ampules of neat CG, not in chloroform, each with 40 mL CG for a total of 480 mL CG.

d. *Packaging:*

1. *Ampule:* Each ampule is made of Pyrex™ and is hermetically sealed. The ampule is 1 inch in diameter and 7.5 inches long.

2. *Cardboard Tube:* Each ampule is packed in a cardboard container (mailing-tube type) with a metal screw-cap top. Each tube has the agent type indicated by agent symbol on the cardboard container.

3. *Can:* Twelve cardboard containers, each packaged into a press-fit metal can. The can is 5.5 inches in diameter and 9.25 inches high. Originally, three ampules of each of the four chemical agent/industrial chemicals were packaged in each can.

4. *PIG:* Four cans are packed into a steel cylinder known as a PIG. The PIG is 6.625 inches in diameter, approximately 40 inches long, and 0.145 inches thick. The open end of the cylinder is closed by a flange end-cover called a flange blank. The flange blank is 9.25 inches in diameter and is secured by eight bolts tightened over a 0.125 inch-thick lead gasket. The empty PIG weighs approximately 80 pounds.

Note: The only difference between the K951 and K952 sets is that the K951 was issued with blasting caps that were packed and shipped in a separate container. The blasting cap container is not processed by the Rapid Response System.

4-1-4.4 Set K953 - War Gas Identification Set, Detonation, AN-M1A1 and Set K954 - War Gas Identification Set, Instructional, AN-M1A1 (Figure 4-1-3)

a. *Old stock number:* FSN 1365-323-7728 (K953), FSN 1365-338-0735 (K954)

b. *Timeframe of use:* Korean War era

c. *Chemical agents and amounts:* Forty-eight glass ampules of which there are eight ampules each of six different chemical agents/industrial chemicals. Distilled mustard (HD), nitrogen mustard (HN-1) and lewisite (L) agent ampules containing approximately 40 mL of solution (chemical agent in chloroform). This is a total of 960 mL of solution with agent, per set or 64 mL of chemical agent per set.

1. Eight ampules of 5-percent HD in chloroform, each with 2 mL HD in 38 mL chloroform for a total of 16 mL HD and 304 mL chloroform.

2. Eight ampules of 10-percent HN-1 in chloroform, each with 4 mL HN-1 in 36 ml chloroform for a total of 32 mL of HN-1 and 288 mL chloroform.

3. Eight ampules of 5-percent L in chloroform, each with 2 mL L in 38 mL chloroform for a total of 16 mL L and 304 mL chloroform.

4. Eight ampules of neat CG for a total of 320 mL.

5. Eight ampules of neat CK for a total of 320 mL.

6. Eight ampules of GA simulant (mixture of ethyl malonate, oenanthic ether, and benzonitrile) for a total of 320 mL.

d. *Packaging:* These sets are packed in ampules, cans, and PIG containers similar to the K951 and K952 as explained in paragraph C-4.3 d., one difference being that originally just two ampules of each of the six chemical agent/industrial chemicals were packaged in each can.

Note: The only difference between the K953 and K954 sets is that the K953 was issued with blasting caps that were packed and shipped in a separate container. The blasting cap container is not processed by the Rapid Response System.

4-1-4.5 Set K955 - Set, Gas Identification, Instructional, M1 (Navy) (Figure 4-1-4)

a. *Old stock number:* FSN 1365-368-6154

b. *Timeframe of use:* Late 1930s to WWII

c. *Chemical agents and amounts:* Seven glass bottles with three chemical agent bottles, each containing 25 mL of chemical agent, for a total of 75 mL of chemical agent per set. Four of the bottles each contain 3 ounces (90cc) of activated charcoal on which chemical agent/industrial chemical is absorbed (described as follows).

1. Two bottles of sulfur mustard absorbed on charcoal - 25 mL of sulfur mustard each or 50 mL total.

2. One bottle of L absorbed on charcoal - 25 mL of L.

3. One bottle of PS absorbed on charcoal - 25 mL of PS.

4. One bottle of Triphosgene (CG simulant) - 3 grams of solid.

5. One bottle of CN - 15 grams of solid.

6. One bottle of DM - 15 grams of solid.

d. *Packaging:*

1. *Bottle:* The seven, round, glass bottles are 4-ounce bottles with a ground-glass stopper that is usually coated (sealed). As previously noted, the bottles frequently contain charcoal.

2. *Can:* Each bottle has its own green metal can. The sealed cans are 4.25 inches in diameter and 6.75 inches high. They have a paint-can-type lid that is sealed.

3. *Box:* The box is a hinged-cover wooden box that resembles a foot locker and measures 30.375 inches long, 15.5 inches wide, and 11.75 inches high. The inside of the box is divided into eight sections. Seven of the sections contain sealed metal cans in sawdust, and the eighth has instructions.

4-1-4.6 Set X302 - Replacement Set, Gas Identification, Instructional (Navy) (Figure 4-1-5)

a. *Old stock number:* FSN 1365-038-5183

b. *Timeframe of use:* WWII to Korean War era

c. *Chemical agents and amounts:* Two bottles each contain 3 ounces (90cc) of activated charcoal on which 25 mL of chemical agent is absorbed (described as follows). This is a total of approximately 50 mL of chemical agent per set.

1. One bottle of HN-1 absorbed on charcoal - 25 mL.

2. One bottle of HN-3 absorbed on charcoal - 25 mL.

d. *Packaging:*

1. *Bottle:* Each bottle is a 4-ounce round bottle with a ground-glass stopper that is usually wax coated.

2. *Can:* Each bottle has its own metal can. The cans are 4.25 inches in diameter and 6.75 inches high, with a paint-can-type lid that is sealed. One bottle is packed with sawdust in the can.

3. *Box:* The wooden box has a hinged cover and measures 7.5 inches wide, 16 inches long, and 11.75 inches high. The box is divided into two sections. Each section contains a can with a bottle that is surrounded by packing material.

4-1-4.7 Sets X545 Through X552 - Replacement Sets (Navy) (Figure 4-1-5)

The following eight types of replacement sets were used by the Navy to replace components of the K955 and X302 sets. The replacement sets X545 through X552 contain two bottles with each bottle having either approximately 25 mL of chemical agent/industrial chemical absorbed on activated charcoal, or a solid industrial chemical as outlined below. They were packaged in the same manner as the X302 (paragraph 4-1-4.6).

a. X545 - triphosgene, CG simulant, (no charcoal)
- 6 grams of solid per set
- old FSN 1365-608-5322

b. X546 - CN (no charcoal)
- 30 grams of solid per set
- old FSN 1365-608-5323

c. X547 - H/HS/HD absorbed on charcoal
- 50 mL per set
- old FSN 1365-608-5324

d. X548 - L absorbed on charcoal
- 50 mL per set
- old FSN 1365-608-5325

e. X549 - DM (no charcoal)
- 30 grams of solid per set
- old FSN 1365-608-5326

f. X550 - HN-1 absorbed on charcoal
- 50 mL per set
- old FSN 1365-608-5327

g. X551 - HN-3 absorbed on charcoal
- 50 mL per set
- old FSN 1365-608-5328

h. X552 - PS absorbed on charcoal
- 50 mL per set
- old FSN 1365-608-5328